agriculture

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Editorial Offices
Ministry of Agriculture, Fisheries and Food
Tolcarne Drive
Pinner
Middlesex HA5 2DT 01-868- 7161

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Procedures have been designed by the N.A.A.S. to simplify the Cash Flow and Balance Sheet aspects of the

Financial Analysis of the Farm Business

B. Peart W. C. Weston

PERHAPS the most striking recent trend in farm management advisory requests to the N.A.A.S. has been the increasing attention focused on capital investment aspects. This is not a phenomenon which relates solely to the general credit stringency which we have experienced of late but is also symptomatic of an underlying trend towards higher degrees of capital intensity and the accompanying financial problems that are posed. These are not issues, however, which are capable of solution by making traditional 'return on capital' measurements. Our advisory experience has shown that the main needs are twofold. The first of these is concerned with liquidity and the problems of husbanding the cash resources of the business. The second aspect relates to the Balance Sheet and its analysis.

To meet this need for a systematic examination of the financial position, a standard analysis procedure has been devised under the heading 'Farm Financial Analysis' and commonly referred to under its code name MA9. The term 'Financial Analysis' has been used to distinguish it from the technical analysis approaches in general use; for example, the Trading Account analysis basis used in MA1/MA2. and the Gross Margin/Fixed Costs analysis basis of the MA4. Training of N.A.A.S. staff in these newer financial analysis methods is now well advanced, and additionally most recording and consultancy agencies are familiar with the processes involved and their interpretation. Furthermore, Cash Flow Analysis is now part of the new Business Recording Scheme.

Cash flow analysis—sources and disposition of funds

Such yardsticks as Profit, Net Farm Income and Management Investment Income are at best unreliable indicators of the extent of the cash surplus or deficit which the business, in its widest sense, has to show for the year in question. Capital expenditure, loan repayments, private drawings and tax payments are not part of the Trading Account but are nevertheless just as much a part of the business of farming as are the features highlighted by the

traditional technical analyses. Cash is the life blood of the business and the factors mentioned are part of the competing calls on the cash which is available to the farmer.

The Sources and Disposition of Funds part of Form MA9, reproduced at Figure 1, traces the path from the Trading Profit or Loss to what has actually happened to the Bank Account. It displays the Sources of Funds used in the business and the way in which those funds have been employed—in American terms a 'where got—where gone' statement. Both Sources and Uses are divided into three categories—Trading, Capital and Private.

As far as Sources are concerned, the Trading Sources consist of adjustments to the Accountant's Profit or Loss figure. Non-cash items which have been included are eliminated. Depreciation of machinery, buildings and fixtures, plus any balancing allowances, are added back. Notional receipts such as rental value of farmhouse and private use of car, and any balancing charges, are deducted. Decreases in valuations and debtors and increases in creditors, in that they respectively represent a release of or further access to cash, are also added to the original profit figure. Capital Sources are receipts from the sale of land, machinery and fixed equipment, and grants and any additional loan capital. Private Sources include cash from outside the business and private receipts.

With regard to the allocation of these funds, Trading Allocations show the cash required to increase valuations, pay off creditors or extend credit to others. Capital Allocations are represented by the purchase of land, buildings, machinery and equipment, and by property improvements and reduction of loan capital. Private Allocations include personal drawings and payment of tax.

Insofar as the total disposable funds exceed the sum of the allocations, the balance will be shown as an increase in the bank account or cash in hand or both. If, however, expenditure has exceeded income during the year the reverse will apply.

The first part of the MA9 therefore seeks to explain where the money has come from and where it has gone; and it should help understanding of the often confusing situation when an accountant's assessment of a reasonable profit is found alongside increased indebtedness to the bank.

Balance Sheet analysis

Much lip service is paid to the importance of the Balance Sheet as the ultimate indicator of the health of the business. Yet it is still a document shrouded in some mystery and there is no doubt that many important management decisions have been taken in the past without due regard to the position it reveals.

To read a Balance Sheet properly is an acquired art developed through practice. But the assessment is aided, firstly, by setting out the salient figures in a manner which enables a ready and intelligent appreciation; secondly, by using appropriate methods of asset valuation; and thirdly, by the prudent use of certain Balance Sheet ratios. Figure 2 shows the layout and contents of the Balance Sheet Section of Form MA9.

As yet only a limited amount of formal analysis of farm balance sheets has been undertaken and, from a wide selection of balance sheet ratios available, those which have been included on the N.A.A.S. analysis form represent our first judgment. Further experience in practical advisory cases will confirm

Figure 1

SOURCES AND DISPOSITION OF FUNDS

SOURCES OF DISPOSABLE FUNDS

YEAR ENDED .....19.....

SECTION A—

TRADING

		£ +	£ −
PROFIT/LOSS (from MA 1, MA 16 or Accounts)			.....
ADD:	Depreciation of Machinery	.....	
	Balancing Allowances	.....	
	Depreciation of Buildings and Fixtures	.....	
	Decrease in Valuation of:		
	Livestock	.....	
	Harvested crops	.....	
	Growing crops and tillages	.....	
	Bought Stores	.....	
	Decrease in Debtors	.....	
	Increase in Creditors	.....	
	Sub-Total (a)		
DEDUCT:	Balancing Charges		.....
	Notional Receipts		.....
	Sub-Total (b)		
	TOTAL (a)−(b)=(c)		

SECTION B—

CAPITAL

ADD:	Receipts—Disposals of Land and Buildings.	.....
	Receipts—Disposals of Machinery and Fixed Equipment	.....
	Capital Grants	.....
	Additional Loans	.....
	TOTAL (d)	

SECTION C—

PRIVATE

ADD:	Cash introduced	.....
	Private receipts	.....
	TOTAL (e)	
	TOTAL DISPOSABLE FUNDS (c)+(d)+(e)=(f)	

ALLOCATION OF FUNDS

SECTION D—

TRADING

	£
Increase in Valuation of:	
Livestock	.....
Harvested crops	.....
Growing crops and tillages	.....
Bought Stores	.....
Increase in Debtors	.....
Decrease in Creditors	.....
TOTAL (g)	

SECTION E—

CAPITAL

Purchase of Land and Buildings	.....
Improvements to Land and Buildings	.....
Purchase of Machinery and Equipment	.....
Loan Repayments	.....
TOTAL (h)	

SECTION F—

PRIVATE

Private Drawings	.....
Tax	.....
TOTAL (i)	
TOTAL ALLOCATED FUNDS (g)+(h)+(i)=(j)	

SECTION G—

PROOF

BALANCE:	Cash/Bank Decrease (k)	.....
	Cash/Bank Increase (l)	.....
	TOTAL (should equal Total Disposable Funds opposite) (j)−(k) or (j)+(l)=(f)	

Figure 2

SECTION H—

BALANCE SHEET AS AT ____19____

Previous Year As at ....19....		£
	FIXED ASSETS	
.....	Land (1)	.....
.....	Buildings and Fixtures	.....
.....	Machinery and Equipment	.....
.....	Breeding Herds	.....
_____	TOTAL FIXED ASSETS (a)	_____
	CURRENT ASSETS	
.....	Other Livestock	.....
.....	Stocks on hand	.....
.....	Debtors and Prepayments	.....
.....	Bank Balance and Deposits	.....
.....	Cash in Hand	.....
_____	TOTAL CURRENT ASSETS (b)	_____
_____	TOTAL ASSETS (a) + (b) = (c)	_____
	CURRENT LIABILITIES	
.....	Creditors	.....
.....	Tax owed	.....
.....	Bank Overdraft	.....
_____	TOTAL CURRENT LIABILITIES (d)	_____
_____	NET ASSETS (c)−(d)=(e)	_____
	FINANCED BY	
.....	Bank Loans	.....
.....	Private Loans	.....
.....	Other Long Term Loans	.....
.....	Owner Equity (including appreciation on fixed assets (2))	.....
_____	CAPITAL EMPLOYED	_____

1. Use present values (i.e. within 4 years).
2. Arising out of footnote (1).

SECTION I—

BALANCE SHEET RATIOS

	Previous year
CURRENT $\frac{\text{Current Assets}}{\text{Current Liabilities}} \times 100 =$	
$\frac{(b)}{(d)} \times 100$ ..... $\times 100 =$	_____% _____%
WORKING CAPITAL/FIXED ASSETS $\frac{\text{Current Assets—Current Liabilities}}{\text{Fixed Assets}} \times 100$	
$\frac{(b)-(d)}{(a)} \times 100 =$ ..... $\times 100 =$	_____% _____%
GEARING $\frac{\text{Loan Capital}}{\text{Owner Equity}} \times 100 =$ ..... $\times 100 =$	_____% _____%
FIXED ASSETS % $\frac{\text{Fixed Assets}}{\text{Total Assets}} \times 100 =$	
$\frac{(a)}{(c)} \times 100$ ..... $\times 100 =$	_____% _____ %
OWNER EQUITY % $\frac{\text{Owner Equity}}{\text{Total Assets}} \times 100 =$	
..... $\times 100 =$	_____% _____%

SECTION J

RETURNS ON CAPITAL

RETURN ON OWNER EQUITY $\frac{\text{Profit (before tax and after long term interest)}}{\text{Owner Equity}} \times 100 =$	
..... $\times 100 =$	_____% _____%
RETURN ON NET ASSETS $\frac{\text{Profit (before long term interest and tax)}}{\text{Net Assets}} \times 100 =$	
..... $\times 100 =$	_____% _____%
RETURN ON TOTAL ASSETS $\frac{\text{Profit (before all interest and tax)}}{\text{Total Assets}} \times 100 =$	
..... $\times 100 =$	_____% _____%

or otherwise the wisdom of the choice. Careful use of the ratios is, however, essential and it is important to examine them in their wider balance sheet context and with reference to their components. No attempt should be made to draw firm conclusions from a few isolated ratios; the trend in them found from a succession over a period of time will always give a better basis for assessment than those for a single year.

The Current Ratio gives the strength of the business in the shorter term by showing the relationship between the current assets of the business and its current liabilities. Attention must also be paid to the truly liquid components of the current assets and to excess liquidity. The trend in Working Capital/ Fixed Assets ratio shows how the balance between achieving adequate liquidity and adequate levels of fixed assets is being maintained. Gearing describes the relationship between the farmers' own capital and that from external long-term sources, and gives an indication of vulnerability to profit fluctuations. The Fixed Assets percentage provides a guide to flexibility. Owner Equity represents the proprietors stake in the business, and is a figure of considerable interest to potential lenders!

Returns on Capital are presented in three ways. In the first place Return on Owner Equity shows the return that the farmer is earning on his own money and is a figure which can be compared with the gross return elsewhere. This must not be viewed in isolation, however, since a high return could be brought about through having a very small share in the business. Thus, while apparently making excellent use of his own capital, the business might be very precariously placed. Return on Net Assets is the commonly accepted measure for return on capital as a test of management efficiency. Return on Total Assets is included in the list because there are farms where bank overdrafts finance not only the current assets but also a significant proportion of fixed assets. In these cases a Return on Total Assets is a more meaningful measure than Return to Net Assets.

Summary

These financial analysis procedures have been developed to meet a growing need to devote more attention to the finance aspects of farm businesses, and they represent an important addition to the armoury of farm management analysis techniques. Form MA9 itself, which incorporates these processes, is available through N.A.A.S. advisers. One Section focuses on cash movements into and out of the business, and, particularly with farms with 'flow of funds' problems, it is recommended that a Sources and Disposition analysis becomes a matter of yearly routine. The formalized Balance Sheet analysis on the other hand is less likely to be regarded as a regular routine, although reading the Balance Sheet itself is a must. All in all, however, it is only through increased awareness of cash flow patterns that greater liquidity control can be exercised; and only through a more complete understanding of balance sheets that the financial security of the business can be assessed and its development assured.

This article has been contributed by **B. Peart, B.A. (Econ.)** who is Chief Farm Management Adviser of the N.A.A.S., London, and **W. C. Weston, B.Sc.,** who is Regional Farm Management Adviser of the N.A.A.S., Aberystwyth, and Chairman of the Technical Working Group responsible for devising the analysis procedures.

'A stitch in time saves nine.' The author reminds those responsible for farm buildings of the truth of this proverb.

Maintenance and Repair in the Farmstead

Nigel Harvey

FARM buildings have two main enemies. The first is time, which renders them obsolete; the second is a combination of time, weather and use, which renders them decrepit. The landowner and the farmer can do little about the first, though by wise planning they may be able to reduce the cost of its consequences. But they can and should do a good deal about the second.

Prevention better than cure

Here as elsewhere, of course, prevention is better than cure and the amount of maintenance required—or, preferably, not required—is a major factor in the choice of materials for new work. But many farmers have inherited more buildings than they have erected. With them they have inherited the problems of maintaining in operational order varied types of structure of varied age, materials and condition. Technically, these problems are not very difficult and an annual inspection of the farmstead and the repair of minor defects before they become major defects is not an excessive managerial burden. But in practice it is all too easy to postpone such inspections and repairs to the tomorrow that never comes. And such delay can be costly.

Thus, one of the few published surveys on the maintenance needs of farmsteads commented sadly that 'the story the figures tell is one of human failure rather than the fury of nature. . . Many of the more serious defects derive from causes well within human power to control'. The cost of making good such defects may be equally serious and can generally be prevented by a small annual investment of time and trouble in routine maintenance.

Let us visit a typical and therefore imaginary farmstead and note the kind of defects which can be remedied early at small cost and so save substantial repair bills later on. But as we pass from building to building let us remember that maintenance is only a means to an end. The economic efficiency we seek may best be served by patching. It may also be served either by replacing some material that requires maintenance by one that does not or, more simply, by abandoning to their fate buildings which are not worth the cost of keeping in repair. There is no point in perpetuating structural nuisances.

Roof defects

Roofs are an obvious starting point. They should be examined on a wet day, at first from the inside to see where water is entering. Look particularly carefully at such weak spots as rafter feet and fascia boards and, even if it means a ladder and a bit of a climb, at valley gutters where perished metal may need replacement.

Individual tiles or slates can be replaced with the aid of copper clips or strips of lead, zinc or copper bent to form hooks top and bottom. It may be difficult to obtain replacement tiles of the right size. If so, a course or two can be stripped and replaced with tiles that match as closely as possible, the old ones being used for spares. When replacements for interlocking tiles are not available, the bottom two or three courses can be removed and plain tiles substituted, the top course of the new roof being bedded in mortar to the bottom course of the old one to prevent the entry of driving rain. Non-corrosive nails should be used in all slate and tile roofs. Incidentally, on exposed sites, central nailing of slates is advisable; this reduces leverage and with it the danger of slates working loose.

A common roofing problem is the maintenance of corrugated sheeting, for its zinc covering is dissolved by acids in the atmosphere and the life of the exposed steel core is limited. New sheeting can be bought ready-protected by a bituminous or plastic covering. Alternatively, it can be protected by painting. Most oil paints, however, do not stick to newly galvanized steel, so it is wise to let the sheets weather for a few months and then clean them and apply paint. But most farmers are concerned not with new sheeting but with old, rusting sheets. If these are very old it may be better to let them rust until replacement is necessary; but if their life is worth prolonging the rust can be removed by wire-brushing, or neutralized by chemical means, and the sheets then painted. Unfortunately, to paint over the rust is pointless, for the rusting continues under the painted surface.

Asbestos-cement sheeting does not require maintenance. This does not, however, mean it is eternal; it weakens and decays over the years. So remember to take a look at it and replace sheets when necessary.

One word of caution—when working on or moving across fragile roofing always use crawling boards to avoid the risk of accidents.

A coat of paint applied in time . . .

Guttering and downpipes

Like roofs, guttering and downpipes should be examined on a wet day, preferably during a heavy rainstorm which will show if the gutters are properly

placed to prevent water overshooting them and, more generally, if they are up to their job of dealing with really heavy rain. Gutters should be cleared annually to remove grass, moss and the varied debris which collects in them. All cast iron work, including, of course, brackets, should be painted regularly. Every trace of rust should be removed, a prime coat of red lead or aluminium paint applied and then a top coat of bituminous paint. All guttering and down-pipes should stand an inch or so away from walls to allow them to be painted all round.

Walls and foundations

Walls come next on the list. Cracks and bulges not sufficiently serious to justify rebuilding can be controlled by inserting tie-rods through the building or by adding buttresses. But first of all identify their cause. It may be old age or it may be caused by the use of buildings for purposes for which they were not designed.

A very common need is repointing. Joints should be well raked out and then brushed and wetted to provide a good key for the new mortar. The mortar used should not be too strong. Recommended mixtures of cement, lime and sand are 1:2:9 in spring or summer and 1:1:6 in winter or in exposed positions. If hydraulic lime and sand are used, the proportions should be 1:3 and 1:2 respectively. All cracks and crevices in walls should be sealed either by pointing with such mixes or by injecting a proprietary mastic sealer by a pressure gun. Holes made by rats and mice should be sealed with fine concrete mixed with broken glass.

Foundations exposed or eroded by stormwater, by vermin or by the overenthusiastic mucking-out of yards need special attention. Damage should be made good and, where suitable, protection by a concrete path some three feet wide along the wall, laid above the top of the foundations or the footings of brick walls, should be considered.

This and that

Hinges and sliding door gear, like all moving parts, need regular lubrication. Door frames, window sills and lintels or archways over doors should be carefully checked. The decayed feet of door frames can be replaced with new timber spliced on to the old or by a concrete stool secured to the floor by mild steel rods. Decaying lintels can be replaced by lintels of concrete or treated timber. The life of doors can often be prolonged by plating the lower part with steel sheeting. Take a look, too, at the lagging of exposed pipes, and replace or reinforce where necessary—the consequence of burst pipes can be expensive as well as unpleasant.

Your regular inspection of the farmstead will certainly save money. It may well also save more than money. So don't forget to check flights of steps and handrails to see if they have been weakened by wear, rot or insects. Take the opportunity, too, of seeing that fire extinguishers are in good order and that everybody on the farm knows where they are and how to use them.

Treatment of timber

It is now generally agreed that all timber used in farm buildings should be impregnated under pressure with preservatives, which gives it a longer life. But much of the timber now found in farm buildings was not so treated

and the only way of protecting it is by brushing or spraying with preservative. This is not, of course, as effective as pressure-treatment but is the best that can be done in the circumstances. The liberal application every three years or so of a preservative, well brushed in, particularly at joints and ends, will provide a useful degree of protection and prolong the life of the timber considerably. Such work is best done in the summer, when the timber is dry and penetration good.

The feet of timber posts exposed to manure in yards may often be beyond such preservative treatment, but it is not always necessary to insert new posts. Sometimes the decayed lower sections can be replaced by a concrete bollard. If so, the rotted foot can be sawn off 6–9 in. above the level to which manure is likely to rise and the post stood on the bollard. A pad of waterproof material should be placed between the concrete and the timber. The post should be secured to the bollard by iron straps 4 ft long set 2 ft in the concrete.

Concrete bollard supporting wooden post from which decayed foot has been sawn off

A word of warning

Most of this article is necessarily concerned with things to be done. But there is one thing you should not do yourself. Electrical installations are among the most important and potentially dangerous items of equipment on the farmstead and should be checked regularly. They should be checked and maintained by a qualified electrical engineer. Doing-it-yourself saves money and gives a lot of satisfaction—but leave your electrical maintenance to the specialist.

Nigel Harvey, M.A., A.R.I.C.S., was a Farm Buildings Advisory Officer of the Ministry from 1946 to 1958 and a member of the farm buildings staff of the Agricultural Research Council from 1958 to 1969. He is now employed in the Department of the Environment.

As a result of a Ministry Enquiry into landowners' expenses during 1967–68 some interesting information has been obtained about

Expenses of Agricultural Land Ownership

P. M. P. Williams **Anne-Marie Brunt**

NEW information* about landowners' expenses in England and Wales in 1967/68 has been obtained from an Enquiry carried out in 1969. The aim of the Enquiry was to obtain factual data about annual outgoings and expenditure on improvements on a variety of properties differing in size and location, so that average levels of expenditure on a national and regional basis could be calculated. The Enquiry showed that on let land the average gross outlay by the owners on annual outgoings, excluding any depreciation and interest charges, was 37*s.* per acre, and on improvements (including grants) 28*s.* per acre. The average gross rent in 1967/68 was 92*s.* per acre. Hence total outlay on annual outgoings and investment in improvements of 65*s.* was equivalent to 70 per cent of gross rent.

Information was also obtained about the average outgoings and improvement costs on property occupied by the owner. Expenditure on maintenance, insurance and statutory charges by these owners averaged 67*s.* per acre. They estimated the market rental value of their properties on average at 143*s.* per acre and fixed capital investment at 92*s.* per acre (inclusive of grant aid). These figures, and those for let land, are not comparable, since owner-occupiers were asked to record their information on the somewhat different basis described later in this article.

Scope of Enquiry

The Enquiry was carried out by the Agricultural Land Service and the Economics Division of the Ministry in co-operation with the Country Landowners Association, the National Farmers' Union and the professional societies. It was conducted on a confidential and voluntary basis by means of a questionnaire completed by a sample of landowners, or their agents, and owner-occupiers, and its success was due largely to the ready co-operation of all who took part. The sample was selected by using a stratified random sample of agricultural properties drawn from the June Agricultural Census returns. Altogether 780 individual ownerships were involved; of these 471

*A.L.S. Technical Report No. 25: Expenses of Agricultural Land Ownership, England and Wales. Single copies may be obtained free from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

(comprising 737 holdings) were owner-occupied farms averaging 442 acres in size. The remaining 309 properties, involving 13,460 let holdings, varied from single farms to very large institutional estates such as those belonging to the Crown, the Church Commissioners and the National Trust. Their average size was about 3,800 acres. The sample related to some 2 million acres of agricultural land or 7½ per cent of the total agricultural area in England and Wales. Out of the total 1·8 million were tenanted, the remainder being owner-occupied.

The principal findings of the Enquiry are shown in Tables 1 and 2.

Let land

On let land, repairs by owners accounted for a quarter of gross rent and management costs at 11*s.* per acre were also significant. Total annual outgoings absorbed on average 40 per cent of gross rent. It is important to note, however, that the net rent of 55*s.* remaining does not represent the net income to landownership, since no deductions have been made for any depreciation, interest on borrowed capital, or tax. Gross annual investment on improvements, inclusive of grant, was equivalent to about half of this 55*s.* the bulk being spent on farm buildings.

Table 1.

Average Gross Rent and Expenditure by Owners on Let Land, 1967/68
(Shillings per acre and as a percentage of Gross Rent)

	s.	*per cent*
Gross Rent[1]	92	100
Expenditure on:		
Repairs	22	24
Management	11	12
Statutory charges	2	2
Insurance	2	2
Total annual outgoings	37	40
Net Rent[2]	55	60
Investment[3]:		
Houses	7	8
Buildings	17	18
Other	4	4
Total Investment in improvements[3]	28	30

1. Actual rents receivable.
2. Gross rent less annual outgoings, before depreciation and interest charges.
3. At gross cost, i.e., before receipt of government grants.

Owner-occupied land

The data for owner-occupied properties were analysed separately. Their expenses included expenditure on certain items of fixed equipment, which is normally undertaken by tenants. Similarly, investment by owner-occupiers included expenditure on capital improvements of a kind often undertaken by tenants on the let properties. As a result the average annual outgoings and investment spending per acre were much higher on owner-occupied than

on let land. A Scottish Enquiry carried out in 1965 also found that per acre expenditure by owner-occupiers was considerably greater than that by landlords.*

The estimates of gross rental value per acre returned by occupiers are calculated on a different basis from the rents recorded for let land. Whereas the rents for let land are those actually paid or payable, owner-occupiers were asked to give their estimates of the rent obtainable if the property were offered to let on the open market, the tenant being responsible for maintenance and repairs. The consequent estimates reflect a large number of individual or subjective judgments, and, unlike actual rents, were not subject to any process of negotiation or arbitration.

Table 2

Average Estimated Gross Rental Value and Expenditure for Owner-occupied Land, 1967/68 (Shillings per acre and as a percentage of gross rent)

	s.	*per cent*
Estimated gross rental value[1]	143	100
Expenditure on:[2]		
Repairs	49	35
Statutory charges	12	8
Insurance	6	4
Total annual outgoings[2]	67	47
Investment in:[3]		
Houses	22	15
Buildings	54	38
Other	16	11
Total Investment in improvements[3]	92	64

1. This is a free market gross rental value assessed by the owner, assuming a full repairing tenancy.
2. Including expenses normally incurred by the occupier.
3. At gross cost, i.e., before receipt of government grants.

Total annual outgoings accounted on average for nearly half of the estimated rental value for owner-occupied properties. Repair charges are the main component of this item. The proportion spent on various types of improvement is similar to that on let estates but the total investment is much higher.

Outgoings and investment

Annual outgoings per acre were highest on properties of less than 100 acres. On these properties the average holding size was lowest and this affected the per acre incidence of expenditure on houses, buildings and other fixed equipment. The lowest annual outgoings occurred on properties of 101–300 acres, and above 300 acres outgoings increased with size up to 5,000 acres. Annual outgoings per acre were highest on dairy farms and lowest on general livestock rearing farms, probably because the latter have, in the main,

*Fixed Equipment on Scottish Farms, Scottish Agricultural Economics 1969, H.M.S.O. 7*s.* 6*d.*

extensive acreages in upland areas and also minimum requirements for fixed equipment. This is borne out by the fact that average outgoings on upland areas were only a fraction of those on lowland properties. Investment expenditure followed a similar pattern as for annual expenses, with minor variations between estate size groups. Investment figures by land and farming type showed that investment was all at a similar level, except for upland livestock farms where it was very low.

Table 3.

Average annual outgoings and investment spending by owners on let land by size group, 1967/68 (Shillings per acre)

	Estate Size Groups (acres)						
	0–100	101–300	301–500	501–1,000	1,001–5,000	over 5,000	All Sizes
Annual Outgoings	53	21	28	36	42	39	37
Average Investment[1]	36	23	26	27	32	26	28
Average size of holding per estate[2] (acres)	47	145	170	227	131	91	116

1. An average of three years' investment at gross cost, before deduction of government grants.
2. The average size of tenanted holdings within the size group.

Table 4.

Average annual outgoings and investment spending by owner-occupiers by size group, 1967/68

(Shillings per acre)

	Property size group (acres)					
	0–100	101–300	301–500	501–1,000	over 1,000	All Sizes
Annual outgoings	116	59	59	49	41	67
Average investment[1]	134	94	86	62	53	92

1. An average of three years investment at gross cost, before deduction of government grants.

The average level of annual outgoings per acre varied considerably between regions; in the West Midlands for instance it was double that in Wales. For all regions repairs accounted for one-half to two-thirds, but the absolute level was more variable. This may have resulted, in part, from differences in repair liabilities which prevail in different regions, but such effects would be masked by major differences in farms and land type. In most regions, but particularly in the north, the majority of tenancy agreements defined the parties' respective responsibilities in accordance with the 'Model Clause' defined in the Agriculture (Maintenance, Repairs and Insurance of Fixed Equipment) Regulations 1948. In the east and south east of England there was a tendency for greater responsibility to be placed on the tenant. Total investment expenditure varied considerably between regions; but there was no obvious relationship between expenditure on annual outgoings and on investment by regions.

Annual outgoings and average investment per acre of owner-occupiers generally decreased with size of property.

Institutional estates

Information for estates owned by such bodies as the Crown Estate Commissioners, the Church Commissioners, the National Trust and the Ministry of Agriculture, Fisheries and Food was collected separately in the Enquiry. Average gross rents per acre on these estates were a little higher than on the other let estates of over 5,000 acres but average expenditure on repairs was nearly half that of the rest. Hence, while total annual outgoings amounted to a quarter of gross rent for these properties, for the rest they totalled 54 per cent. Investment in improvements, however, was 31*s.* or 34 per cent of gross rent from these large estates compared with 30 per cent on the remainder of let land in the whole sample.

The characteristics of these large estates, which were sampled separately, were probably due mainly to long-established policies of estate re-organization, improvement and renewal. The incidence of taxation may also have had a less significant effect on the division of expenditure between repairs and improvements on institutional estates such as these.

Limitations of the Enquiry

Although the Enquiry has satisfactorily achieved its immediate aims, the landowner's natural desire for confidentiality conflicted with the investigator's need to check and discuss figures with participants in order to obtain uniform and reliable information. Topics such as sources of funds, reasons for taking investment decision, etc. will always be sensitive subjects. Nevertheless a series of yardsticks and analyses on costs and returns on which estate management policy and budgeting could be based, shown by region, type of farming and holding size, would provide useful guidance to landowners and their advisers. It is hoped that the results of the Enquiry will encourage further investigation into the expenses and investment associated with land ownership and occupation.

Miss Anne-Marie Brunt, B. A., is with the Ministry's Economics Division, London and **P. M. P. Williams, A.R.I.C.S.,** is with the Agricultural Land Service, London.

Advisory Committee on Agricultural Education

The Department of Education and Science has announced the appointment of an Advisory Committee on Agricultural Education to report on part-time and certain full-time courses of agricultural education, other than in universities, in Great Britain. The Committee has been set up jointly by the National Advisory Council on Education for Industry and Commerce and the Scottish Technical Education Consultative Council.

The Chairman of the Committee is Professor J. P. Hudson, Director of Long Ashton Research Station, University of Bristol.

Modern Farming and the Soil

Nigel Strutt

THE AGRICULTURAL Advisory Council's Report on 'Modern Farming and the Soil' was published on 12th January.* Since then there has been much comment and discussion about what the Report has to say and on the recommendations of the Council, and the Minister announced his reactions to it in his Written Reply to Mr. Peter Mills, M.P. on the day of publication.

My object in this article is not to summarize the Report, or even to lift out interesting snippets of information, which are best obtained by reading the Report itself, but more to explain the Council's approach to the job they were given.

The Council were given very wide terms of reference:

> 'To advise whether, and, if so, the extent to which present practices are having adverse effects on soil fertility and soil structure; whether it considers that the National Agricultural Advisory Service has all the information necessary to advise on methods of preventing such damage or remedying it after it has taken place; and whether any further steps are necessary to get this advice across to farmers.'

With such a remit it seemed wrong to try to erect rigid definitions at an early stage in taking evidence, and the Council invited evidence from anyone who cared to commit thought to paper. We received over one hundred submissions, a response which showed very clearly the widespread concern felt about modern farming practices. We interviewed seventeen of those giving evidence to find out more about specific problems or areas, and we thought it was important to investigate the situation in the Ministry Regions. A considerable time was devoted to gathering this regional data by means of written submissions, fact-finding tours, and discussions; in all the work of data collection and our consideration of the evidence lasted well into June 1970. We had to commit ourselves very heavily to our task in order to get through it in the time, for we were anxious to meet the request for an urgent report.

A consideration uppermost in our minds when we wrote the Report was that it had to be relevant and useful to the farmer. The problems of soil structure and fertility affect him directly and we thought we would not get very far unless we set out the reasons for problem situations, the remedies available, and the implications of action—or lack of action. However, we had the major responsibility to the Minister to report the national situation

*H.M.S.O. £2.2.0 [£2·10]

to him and to make recommendations for improving that situation. Therefore we opted for a report written in lay terms, which made recommendations to the Minister on points of policy and gave guide lines to the farmer on points of practical action on the farm.

It inevitably became a lengthy report. It takes the form of an analysis of the state of the soil in 1970; Part 2 describes the characteristics of soil and soil structure, with the aim of explaining why soils behave as they do, and Part 5 (Regional Analysis) identifies the soils 'at risk' in each Ministry Region. We hope this information will enable the farmer to judge the treatments most suitable to his soil. To help readers understand the distribution of soils our Report includes soil maps of each Region in colour; as far as we know such maps have never before been drawn for the whole country, and we are convinced they will be most valuable. On a more general basis the problems are analysed one by one in Part 3, and the majority of the recommendations involving research stem from the situations we outline in this systematic analysis.

We have incurred some criticism for omitting detailed discussions of the economic climate of modern farming and the financial restrictions operating today. We were not blind to economic factors—indeed farmers were only too ready to point out their individual circumstances—but we were given a specific job to do, with clear terms of reference. This was to be a technical inquiry, to consider what effect our farming was having on the soil itself. I think this objective analysis is absolutely vital to give the background against which both technical and economic decisions must be made. These decisions are for others, not for the Agricultural Advisory Council.

This is the first time all the strands of modern farming have been drawn together and discussed in conjunction with the husbandry techniques needed to make sure the soil remains productive. I hope the Report will be read by many farmers as well as research workers and advisers, for I firmly believe it will be of practical use to them and help them boost the capacity of their farms.

Nigel Strutt, T.D., D.L., is Chairman of the Agricultural Advisory Council.

Theme of 1971 Royal Show – 'Animal Health Year'

The British Veterinary Association, The Ministry of Agriculture, Fisheries and Food, and the National Agricultural Centre will co-operate to highlight aspects of preventative medicine at this year's Royal Show, to be held at the National Agricultural Centre, Stoneleigh, from 6th—9th July, 1971. This co-operation will underline the financial benefits of maintaining animals in good health.

Mr. W. R. B. Carter, Deputy Director of the National Agricultural Centre, has said "I believe that the theme will make considerable impact because of the increasing importance of livestock farming in British agriculture and, therefore, the importance of management and husbandry through preventive medicine."

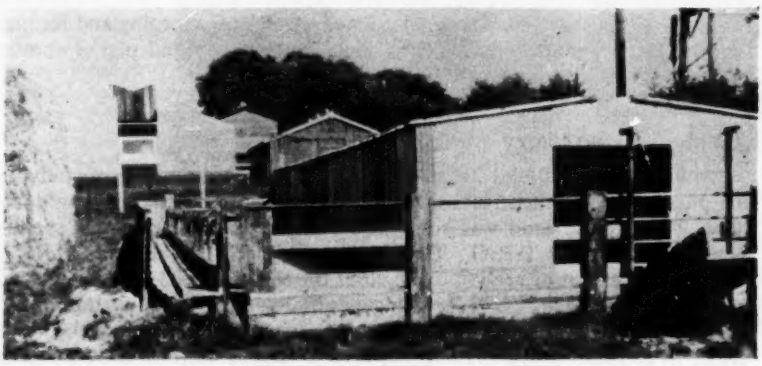
The University of Newcastle upon Tyne is justly proud of its agricultural research and practical help to the industry. Here can be described but briefly some of the activities of its

Cockle Park Experimental Farm

J. A. Hills, *Assistant Director of Cockle Park Experimental Station*

COCKLE Park, the experimental farm of the University of Newcastle upon Tyne, is situated some twenty miles north of Newcastle and five miles north of the pleasant market town of Morpeth, in the county of Northumberland. It is an exposed farm of 695 acres, mainly glacial drift in origin, rising to an altitude of 370 feet. The annual rainfall is 29 inches. Normally spring is very late and this, coupled with the heavy nature of the land, results in harvests which are not usually completed before the end of September.

The primary function of Cockle Park is to provide field research facilities for members of staff and post graduate students of the University. It is also one of the main sub-centres for crop variety testing in conjunction with the National Institute of Agricultural Botany. While research is the first consideration at the farm, every effort is made to obtain a good commercial result whenever possible in order to finance further research projects. Livestock enterprises in particular suffer financially because of research demands.



Inexpensive home-constructed suckler cow kennel

Historical background

In 1896, Northumberland County Council leased the farm for a period of twenty one years for use as a county demonstration farm. At this time the farm was about 400 acres in extent. The lease was renewed in 1917, together with the addition of 60 acres of extremely heavy land in poor pasture on the adjoining and inappropriately named Paradise Farm. In 1936 the whole area

was taken on a 999 year lease, which was transferred to the University in 1947. The University purchased the adjoining Tritlington West Farm in 1956 to give the present farm size of 695 acres.

Even in County Council days, the University was closely associated with the farm in that successive Professors of Agriculture have been the Directors of the farm.

Space does not permit a very detailed examination of past, or indeed current, experimental work. The early grassland work and livestock grazing experiments at the farm by Professors Somerville, Middleton and Gilchrist are well documented elsewhere. Suffice it to say they had a profound effect on the agricultural thinking of the day. In particular the famous Cockle Park grass seeds mixture established the farm as an agricultural centre of repute, and basic slag and wild white clover were synonymous with its name.

Over the years, much of the work done at the farm has been of direct practical significance to the industry. Recent notable examples of this are wilting and additive work with silage; the cleanfield system of grazing for reduction of worm burden in sheep; forward creep grazing of lambs, work on early weaning systems for calves, evaluation of beef fattening systems and associated carcase work, and in-wintering accommodation for ewes. All of this work has been under the control and supervision of Professor Cooper, the present Director of Research.

Current work

It is not possible here to take more than a brief look at some of the current research and development work which is being undertaken by the farm. Much of this work is highly practical in nature and will, we hope, again be of direct benefit to the industry. We are moving more and more to specialist enterprise investigation work at Cockle Park involving the use of blocks of land set aside for specific purposes, i.e., farmlets. Currently four of these are in operation on the farm. In addition much specialized breeding and feeding work is being undertaken, involving dairy cows, sheep and pigs. I should now like to describe briefly these farmlet enterprises.

Spring calving dairy herd

A 14-acre block of land was allocated in 1969 for the purpose of studying the possibilities of intensive utilization of grass with a spring calving dairy herd. This area of land was sown down in three blocks of single species swards, namely S24 P.R.G., Taptoe Tetraploid P.R.G. and S23 P.R.G., giving a succession of growth throughout the season. The land was stocked with twenty-six Jersey cows, including eleven first calvers, a stocking rate of 0·54 acres per cow. At no time during the season were the cows short of grass. In addition to the grazing, the area produced 65 tons of 30 per cent D.M. silage and 7 tons of high quality dried grass. Production per acre was 1,050 gallons of milk in the first year. In 1970 the unit was expanded to take more stock and an 8–acre cereal block was incorporated to make the unit more self sufficient (barley for feeding, straw for feeding and bedding) and at the time of writing results for this season are better than those in 1969. We are expecting to achieve a gross margin of £130 per acre as against a forecast of £125. In 1971 the unit will be further expanded to carry forty cows on 22 acres of grass, plus 8 acres of cereals.

Lowland suckler herd

An investigation is being carried out into suckler calf production in conditions which we feel are appropriate to many arable farms, where only a limited area of grazing but large quantities of barley straw and barley are available. The system basically involves intensive use of grass by concentrating cows on pasture during the last month of pregnancy and during the suckling period, while during their most unproductive period they are on a diet of barley straw and barley plus protein.

Thirty Hereford × Friesian suckler cows are kept, calving down in July–August. They are milky cows and in order to make use of surplus milk a second calf is fostered on. We have developed a technique for this fostering procedure which is very successful. Calves are weaned in mid-December and from then until the end of May the cows are housed in cheap home-constructed kennels (material cost £6 per cow) and fed on a diet of 14–16 lb barley straw and 4·4 lb of barley plus protein per day. The steaming up period coincides with aftermaths from first silage cuts and because of the winter diet of the cows no conservation is required for their needs; therefore the reliance on grass, particularly conserved products, is kept to a minimum. Output per cow per annum is over £100. Stocking rate is one cow and two calves per grassland acre.

Interior of kennel shown on page 65

Intensive fat lamb/cereal unit

We have established a 42-acre farmlet where the aim is to intensively produce fat lambs on grass which is basically a break in cereal rotation. The rotation is wheat, mixed corn, rape, barley (undersown), first year ley, second year ley, i.e., 6 × 7-acre paddocks with a total of 14 acres grass. This grassland area carries 120 Finn × Clun ewes and their lambs, a stocking rate of 8½ ewes per acre plus their lambs (200 per cent lambing is aimed at when an age-balanced flock is eventually established).

Wheat is sold as a cash crop, as also is the barley and that proportion of the mixed corn which is surplus to the flock requirements (approximately 80 lb per ewe, including creep for lambs). The rape is used to finish store lambs. Grass provides the grazing requirements of the flock plus all the conservation requirements of the ewes, which are in-wintered from the end

of December until lambing. The aim is to produce 500 lb meat per grassland acre with an age-balanced flock; currently this is running at 400 lb.

Semi-intensive beef and sheep unit

This unit has been established on the 65-acre block of extremely heavy land, formerly Paradise Farm. The nature of the soil makes it entirely unsuitable for cropping purposes. The aim of the unit is to look at the viability of a livestock enterprise in a small farm situation based on permanent pasture but without the high capital investment associated with a dairy enterprise. Fat lamb production is integrated with the production of semi-intensive beef. Every endeavour is made to control endoparasites in both sheep and cattle by field hygiene and tactical drenching. Stocking with both sheep and cattle gives a much more flexible grazing system than either of these alone. Two hundred ewes and their lambs (average 155 per cent lambing) plus fifty beef steers are run on the unit. Adequate, cheap, farm-built buildings have been erected on the unit to house the cattle and ewes for the winter period. Apart from straw and concentrates the unit is self-contained, providing grazing during the summer with surplus grass being conserved as silage (180 tons) and some toppings hay (about 20 tons). The latter is an integral part of pasture management.

Liveweight production during the summer grazing period is 600 lb per acre. Most lambs go fat off the unit, those not achieving marketable condition are sold store. The cattle (Hereford cross and Friesian) are fattened inside during winter on silage and barley. These steers are bought in during April at 7–8 months old weighing just over 4 cwt.

Grass drying

One of the most significant recent additions to research facilities at Cockle Park has been the presentation to the University of a small prototype grass drier. Such a unit in an on-farm situation enables many different specialist interests to be catered for; farm management, engineering, nutrition, biochemistry, etc. enabling close co-operation between specialists. The University is embarking on a programme of research embracing all of these facets and with the likelihood of Common Market entry in the not too distant future we consider that this work is likely to be of very great consequence.

Other projects

Obviously there is much more work being carried out at Cockle Park than I have mentioned. A thriving and ambitious pig research programme is in progress on various aspects of breeding, feeding and carcase evaluation. Similar work is in progress with Clun Forest sheep, and parasitology studies form a large proportion of the work with sheep. A detailed research programme involving the feeding of dried grass and many other projects are in progress. Each subject might well merit separate specialist articles. This has been an attempt to show some of the basic practical research and development projects currently under way at Cockle Park. The farm has had a long and successful association with the industry in the development of new techniques and the aim in the future will be to continue this work.

This article has been contributed by **J. A. Hills**, who is the Assistant Director of Cockle Park Experimental Station at Morpeth.

Break crops are of considerable importance in a cereal cropping rotation, and as a source of protein. There is, therefore, great interest in

Trends in Arable Break Crops

R. G. Hughes

WELL managed grass is outstanding in its ability to improve soil structure and provide the necessary disease-free break in cereal cropping. However, intensification of grassland management, together with restrictions on capital required for rapid increase in stock numbers, often means that the acreage of ley falls short of what is necessary to maintain a favourable grass/cereal balance. It is in this situation that the arable break crop offers the greatest benefit.

In the absence of livestock enterprises or other means of profitably using ley-breaks, proper use of arable break crops can be the means of maintaining satisfactory cereal yields. But in recent years the inconsistency of yield allied to marketing problems has undoubtedly dampened the enthusiasm of growers of field beans, dried peas, oil seed rape and other arable break crops. The survival of these crops depends largely on finding a means of stabilizing economic yields and establishing a favourable market for the produce.

Field beans

Field beans are notoriously susceptible to drought and early sowing, preferably on soils with adequate moisture reserves, is essential to guarantee high yields. Restricted development of a good root system early in the life of the bean plant will also result in low yields; in most soils deep busting of cereal stubbles prior to planting can create a more favourable habitat for satisfactory root development.

Waterlogging, leading to a build-up of foot-rot, is often the cause of failure in winter beans, particularly where simazine, used for weed control, is harassing young plants. Too shallow planting, which may invite frost kill, bird damage or herbicide toxicity, can lead to irregular and low plant populations. The winter bean can tolerate planting at depths of up to six inches and the plough is often the best means of attaining a safe depth. Spring tic beans, on the other hand, are best sown at three to four inches.

New herbicide. Simazine can provide excellent control of blackgrass and many broad leaved weeds but, at rates tolerated by beans, it is unsatisfactory against perennial weeds, particularly the rhizomatous couch species. A new herbicide for pre-emergence application—pronamide (RH 315) —offers means of retarding the growth of perennial grass weeds and, in addition to

providing adequate control of many broad-leaved weeds, has, in trials, given highly satisfactory wild oat control.

Yield. The optimum plant population for spring tic beans appears to be in the region of 300,000 established plants per acre, whereas with the highly branched winter horse bean at least 180,000 plants should survive to harvest to give satisfactory yields. These targets demand a sowing rate of 200 lb per acre for spring tic beans and 240 lb per acre for winter beans. Row width is of less consequence except that it is more difficult to attain even flow distribution of the seed when it exceeds fourteen inches. The level of yield is more likely, however, to be a reflection of the number of pods per acre, but the establishment of a satisfactory plant population is a pre-requisite of adequate pod development.

Even in the best crops only 15—20 per cent of flowers eventually set pods. With the varieties currently grown, aids to cross pollination, such as importing bee hives, will enhance pod set, especially in large acreages of beans. There are other hazards to satisfactory podding. In the spring crop, aphid damage hinders pod set and in some areas annual preventive aphicide treatment is justified. A means of forecasting aphid activity in beans, based on winter egg and spring populations on spindle and other hosts, would be a tremendous boon to spring bean growers. Winter beans can suffer badly from attacks of chocolate-spot disease. This is largely a crop hygiene problem, especially when mild winters are followed by high humidity conditions during summer months. Many growers in southern counties are now accustomed to spraying low dosage herbicide applications to kill young shed plants in autumn cereal stands before they transmit disease spores to nearby newly sown bean crops. Methods of avoiding stem breakage by wind or other factors by careful siting of crops, and avoiding the long weak strawed varieties, can also lessen the ravages of chocolate-spot disease.

New varieties. Plant breeding undoubtedly holds the key to improving the yield of field beans. Apart from improvements in inbred open pollinated varieties, the introduction of hybrid beans could, in spite of higher costs of seed, provide the necessary boost to the yield capacity. Exploitation of automatic self-fertility derived from Mediterranean varieties may also provide the answer to pollination failure in the field, whilst at least one private breeding station is currently investigating the possibility of eliminating nodule formation on the bean root so as to provide a plant capable of known response to bag nitrogen. The nitrogen fixing nodules can be an embarrassment and hinder efficient harvesting because they encourage new top growth at a time when the main pods are ripening.

Utilization. The use of beans in home mixed livestock rations has much to commend it and the introduction of wet storage techniques, using propionic acid, may encourage continued production for this purpose. Compounders on the other hand, because of the problems of storage and mixing, are often reluctant to handle field beans except in modest amounts. Other outlets for processing are, however, being investigated. In the meantime the buoyant export market trade continues. Clearly field beans, as sources of protein, are more highly valued in Europe than in this country.

Harvest peas

The future for dried peas was reviewed by A. J. Gane in the September 1970 issue of *Agriculture* in which the possibility of replacing imported

Alaska peas by the home grown small blue pea Vedette was discussed. But the danger of over-production was clearly indicated. With a home requirement of 100,000 tons, either processed or in packets, an acreage of some 70,000 in 1970 spells saturation.

The dry summer of 1970 was not generally conducive to high yields of harvest peas, although the quality was above average. This seasonal pattern illustrates the need to select fields with uniform soil type and depth to avoid harvesting problems caused by uneven maturity and ripening. In less favourable harvesting conditions reliable desiccants, used correctly, could go a long way towards safeguarding yield and quality. It is also clear that pest problems in new production areas will continue to increase; these will not only demand skill and precision in the timing of spraying but will also add to the variable costs involved in growing dried peas.

Oil seed rape

As an arable break-crop, oil seed rape has given a more consistent yield than field beans during recent years. On the other hand the gross margins obtained with spring sown rape have not generally been very encouraging. The winter sown swede rape offers at least 20 per cent higher yield and higher oil content. New varieties of winter oil rape from France and Sweden, e.g., Titus and Panther, are more hardy than varieties previously grown in this country; they can be sown in late September without detriment to yield, thereby allowing a longer period for cleaning land and preparing seedbeds after cereal harvest.

There are also prospects of even higher oil yields from new varieties undergoing trials at present. Improved techniques of husbandry to attain more suitable seedbeds, more careful selection of seed by size, and a greater understanding of the nutrient requirements of the winter crop can also lead to higher oil yield of the quality required for various processing needs. The potential of herbicides such as dalapon and T.C.A. has not yet been fully explored for the control of perennial grass weeds, using the smothering capacity of the winter rape crop to provide a means of eradicating couchgrass. The more highly branched winter swede rape will usually require swathing before combine harvesting; but its earlier maturity in late summer, compared with autumn ripening of spring rape, will lessen the need for costly and tedious seed drying operations.

Provided it is possible to reduce pigeon damage and contain any likely build-up of other pests such as pod weevil, winter oil seed rape production in this country could meet the challenge from overseas competition and prove a rewarding arable break crop.

Other crops

Alternative arable break crops are often in danger of over-production. There are obvious present-day limitations on the processing requirements of home-grown linseed, oil poppy, coriander and other exotic crops. Seed production of brassica, parsley and similar crops is generally well catered for by established growers, whilst field vegetable production has developed to the point where the skills and precision required far out-strip the resources available on the average cereal-dominant farm. In any case the scale and profitability of the production of such crops, unless achieved by co-operation, can be a limiting factor.

The acreage of oats as a break crop has been rising steadily, no doubt encouraged by high yields of winter varieties achieved in recent years. The trend towards spring oats is now spreading and in this lies the danger of over-cropping, leading to cyst eelworm problems detrimental to subsequent cereal cropping and, on present evidence, to an increase in leaf-diseases of oats. The winter oat crop, which establishes a good root system before pests or diseases exert their main effect, is less prone to damage, provided it does not succumb to the rigours of a hard winter. The winter hardiness of modern oat varieties has hardly been challenged during the recent relatively mild winters.

Limitations of break crops

The introduction of an arable break crop at frequent intervals following not more than two or three cereals after long ley can be a significant means of maintaining high cereal yield. Single, one year breaks, after longer cereal sequences, are of doubtful value in that the benefits can be very short lived. After long cereal runs the two year break, based on grass or a combination of arable break crops, offers a more reliable means of effectively reducing the toll from cereal pests and diseases.

Likely benefits derived from introducing arable or grass breaks in a cereal dominant rotation are dependent on the standard of husbandry achieved. The presence of volunteer shed cereals and couchgrass, as carriers of cereal disease, negate the value of break crops. Growing break crops is not an automatic passport to rejuvenated cereal yield. The ultimate value is often a reflection of skills in crop management,.

The author, **R. G. Hughes, B.Sc.**, is Regional Crop Husbandry Adviser with the N.A.A.S. at Reading.

Dry Bulb Onions

The first of the Horticultural Enterprises series of N.A.A.S. booklets—No. 1 Dry Bulb Onions—has now been published.*

With the exception of the war years, when imports were restricted, English onion growers have found it very difficult to compete with the high quality, low-cost dry bulb onions imported from more favoured climates, so the acreage tilled and the quantity produced in this country is relatively small.

It is still difficult to compete with imported onions but new knowledge and techniques of production, weed control, harvesting and storing have been developed which enable growers to produce more and better quality onions at a lower cost.

These methods have been developed at Research Institutes, at the N.A.A.S. Experimental Stations and by Advisers co-operating with growers on their holdings. Properly applied, the methods described in this new-style booklet will enable bulb onions to be grown and marketed to produce an adequate cash return for the grower. The format of this booklet is similar to some already produced on farming subjects. It not only sets out clearly each step to be taken in producing and storing bulb onions but also shows the level of costs and the returns that can be expected on an average holding on a suitable site.

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*Single copies are obtainable, free of charge, from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

Today growers cannot speculate on a crop which may mature in a period of glut. Experiments at Stockbridge House E.H.S. show that continuity of production can be achieved by

Planned Brassica Production

I. Sandwell

HISTORY does not record when members of the brassica family were first cultivated and used as food. Certainly both Greek and Roman authors writing two to three hundred years B.C. described cultivated plants which almost certainly were forerunners of our present cabbage and kale. Cauliflowers do not appear to have come into general cultivation until the eighteenth century and Brussels sprouts a century later. Then large private gardens on country estates were at their zenith; gardeners went to extreme lengths to produce out-of-season vegetables for the house or Hall and expense was no obstacle. At that time, too, many of the traditional market garden areas around London and the large industrial towns developed to provide vegetables for the rapidly increasing population. The factory workers of that period were often of country stock and were sufficiently close to the land to appreciate the first green peas or the first spring cabbage of the year.

Modern demands

While there are many who still appreciate the value of fresh produce and are willing to pay for out-of-season delicacies, an ever increasing section of the population now buy their vegetables either canned or quick frozen. Many of those who still buy fresh vegetables have ceased to be governed by the weather or the calendar and they expect to see the same pre-packed article on the supermarket shelves at all times of the year. The grower is faced with the problem of meeting these modern demands and cropping schedules. Costs today are so high that few can afford to produce speculative crops which may mature in periods of glut. Even with a versatile family such as the brassicas his skill and ingenuity is taxed to the limit, particularly when economic considerations deny him some of the more extreme measures developed by the old private gardener. His task is made more difficult when the crop has to be grown to a pre-determined size and quality specification.

Climatic dificulties

The planning of brassica production would be a simple matter if our climate was uniform throughout the year. All that would be necessary would be to choose a suitable variety to meet our quality specification and then to sow or plant at regular intervals using standard cultural techniques. The two histograms of the number of day degrees for each month of 1968 and 1969 show just how far the British climate is from this ideal. With many temperate

plants it is only when the temperature rises above 42°F that any appreciable amount of growth is made. Data for the brassica crop is not extensive, but it has been shown* that there is a very close relationship between the growth of early cauliflowers and day degrees above 42°F. What is immediately obvious from the histograms is the broad similarity between the two years. There are annual differences; for instance March 1969 was much colder than in 1968. However, these differences tend to be over-shadowed by those which occur month by month within one year.

Knowledge of the seasonal pattern has enabled experimenters to draw up cultural methods which will give a succession of brassica crops throughout the year. In many cases they have been able to adopt or modify existing techniques. At certain times of the year, however, it is still not possible to plan crops with any degree of precision and completely new techniques will have to be developed.

Cauliflowers

Most of the problems involved in growing a succession of brassicas are met within the cauliflower crop. There is an additional complication in that the formation of the edible part of the cauliflower plant depends on the transfer from the vegetative to the reproductive phase; this is a process which can be delayed or hastened according to temperature, a period of low temperature being necessary for the initiation of the actual flower.

A convenient time to begin the cauliflower year is with the early summer crop. Plants are raised from sowings made in the autumn, overwintered in cold frames or glasshouses and planted out during early March. By then the plant will have experienced sufficient cold weather to trigger off flowering and from then on it is entirely dependent on the build up of warm temperatures to grow the embryonic flower into a mature curd. Each year this build up of temperature accelerates during late April, through May and into early June. As a result the early summer cauliflower crops consistently each year through June. A spread of cropping can be obtained by selection of true early, mid-season and late varieties, that is, those which respond to the environment in different ways.

Late varieties can be delayed further by restricting growth in the propagating stage using such means as close spacing or growing in small containers. Sowings made under glass in January, February and early March will give a successional supply of cauliflowers during July and August. Sowings made in May or June should give cauliflowers from September to November, but the maturity of the crop at this time is very sensitive to variations in climatic conditions. A warm period during August can delay the onset of curd initiation, thus delaying maturity. This can be aggravated if late September and early October turn cool. In these shortening days growing conditions in terms of day degrees build up very slowly and quite small differences in temperature can make big differences in the actual maturity date. Roscoff cauliflowers maturing during the winter months are similarly affected. They, too, are sensitive to temperatures during the early autumn curd initiation period; this, coupled with slight fluctuations in winter temperatures, can result in variations of up to five weeks in maturity date from one year to the next.

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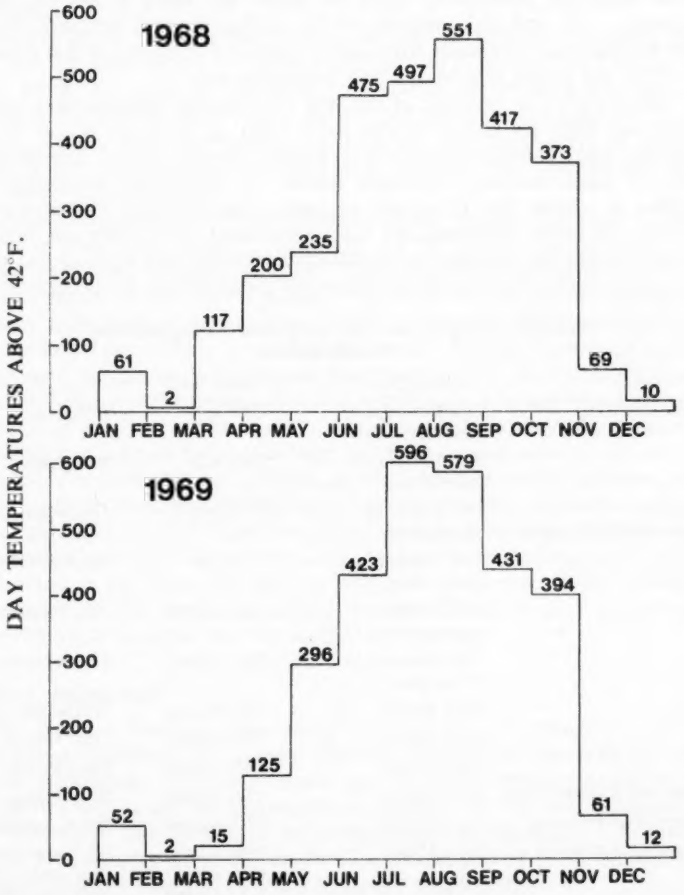
*Salter, P. J. 1960—The Growth and Development of Early Summer Cauliflower in Relation to Environmental Factors. *Journal of Horticultural Science*. 35·21.

The obstacles to producing a perfectly even supply of cauliflowers throughout the year are considerable and are not likely to be overcome by existing cultural methods, although considerable advances have been made. From the numerous variety trials carried out it may be possible to select those which are less sensitive to climatic fluctuations, but it is doubtful whether this alone will give the complete answer. Research work with cauliflowers goes on apace and some fairly revolutionary techniques may be introduced as more knowledge of the plant is gained.



Histograms showing day degrees above 42°F, calculated approximately by subtracting 42°F from daily mean air temperatures converted to monthly totals

Brussels sprouts

By comparison, planning of other brassicas is relatively simple. With Brussels sprouts, for example, it is the vegetative part of the plant which is eaten and so a period of low temperature is not necessary. A further advantage is that the crop, when mature, will remain in marketable condition for

3–4 weeks and more, so that the actual timing of harvesting is not so critical.

Three main factors are used to time the Brussels sprout crop; variety, sowing date and time of stopping or cocking (the removal of the apical meristem) to induce uniform maturity. Variety trials show a true difference in date of maturity, and early, mid-season and late varieties have been selected for experimentation. By sowing early varieties early and late varieties late it has been possible to exploit these natural variations. By removing the growing point from the earliest varieties it is possible to induce still earlier cropping, particularly when the plants are being grown for single harvesting. The cultural methods so far devised enable Brussels sprouts to be produced economically from mid-August to February and it is possible to extend the season into March in a favourable year.

Table 1 shows an example of the type of cropping schedule that can be drawn up. Only by sowing under some form of glass protection during February and transplanting can a mid-August crop be assured. The development of single harvest techniques geared to mechanical harvesting has resulted in a great deal of activity amongst plant breeders. Numerous new varieties are being developed and those mentioned in the table are likely to be superseded; but sufficient information can be obtained from variety trials to enable the new varieties to be fitted appropriately into the programme.

Table 1. A typical continuity programme for single harvest Brussels sprouts

Variety	*Sowing Date*	*Stopping Date**	*Week of Harvest*
Early Half Tall	15th February—under glass	20th July	17th August
	15th February—under glass	20th July	24th August
Topscore (alternative Peer Gynt)	15th February—under glass	27th July	31st August
	15th February—under glass	27th July	7th September
	15th February—under glass	3rd August	14th September
	15th February—under glass	3rd August	21st September
Indra	†Early March	10th August	28th September
	Early March	17th August	12th October
	Early March	17th August	19th October
Roem van Kloosterburen	Early March	17th August	26th October
(alternatives Frigostar	Early March	17th August	2nd November
Barendrecht Market)	Early March	24th August then weekly until 5th October	9th November then weekly until 14th December
Gravendeel	Early April	5th October	21st December
(alternative Seven Hills)	Early April	12th October	28th December
	Early April	Unstopped	4th January then weekly until mid February

*Provided 50 per cent of the plants have basal sprouts approximately ¾in. diameter.

†This and later sowings can be direct drilled if soil conditions and weather permit. The early March and early April sowings could be direct drilled in mid April and early May respectively.

Cabbages

Of the entire brassica family, the cabbage exhibits the most marked season-to-season variation. To suit the traditional market spring cabbage provide the first fresh green vegetable following the shortages of the late winter months. Round headed Primo type cabbages are welcomed when they mature in June. During the summer and early autumn, when there is a wide choice of other vegetables, drumhead cabbage satisfy the day-to-day family requirements. The hardier January King and Savoy supply the winter months.

Spring greens are now marketed from October until the following May. During the more severe mid-winter weather the most suitable growing area may be the South-West. Cropping programmes for spring greens have not yet been formalized but it is unlikely that the problems involved will be very great. As the crop is established during the shortening days of autumn, sowing dates will need careful planning, particularly for crops required in the autumn and early winter.

During recent years the British housewife has become interested in Dutch white cabbage. The dense white heads can be carried conveniently in the shopping basket; wrapped in shrink wrap they make an attractive pack on the market stand. Mature cabbage can be harvested by September. Being only slightly frost hardy it deteriorates quickly in the field after Christmas but it can be stored successfully throughout the winter. Simple stores using ambient fan-blown air on cool nights will keep cabbage in good condition until March. Refrigerated storage will prolong the life for a further two months but the cost of the more sophisticated methods needs to be carefully assessed.

January King and Savoy Cabbage have not been grown outside of their traditional season and their production has tended to decline in recent years. The Scottish Horticultural Research Station recently produced a hybrid cabbage named Celtic which has some January King characteristics. This can be produced by August from early sowings. Cabbage from later sowings will stand in the open through the winter until March. If this variety is acceptable on the market it should not be difficult to plan a continuity programme to cover at least six months of the year.

Other brassicas

The brassica family includes many crops which are unknown or do not find a ready market in this country. The recently renewed interest in calabrese, which incidentally is by no means a new vegetable, shows that the British housewife will accept an unaccustomed product if it is well presented. If the interest in this crop is to be sustained the horticulturist will have to devise a continuity programme. The knowledge gained from the study of other brassicas should make this a relatively simple matter.

I. Sandwell, N.D.H. (Hons.), is the Deputy Director of Stockbridge House Experimental Horticulture Station.

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Experiments carried out at Terrington E.H.F. have shown that distinct advantages can be gained by

Growing Potatoes in Wide Rows

R. H. Jarvis, *Terrington E.H.F.*

FOR many years maincrop potatoes were grown in rows 27 or 28 in. apart. This width fitted in very well with the horse and with the implements and carts which he drew behind him. It is interesting to note the close agreement between the width of two potato rows 28 in. apart and the standard gauge of Britain's railways, another measurement which owes its origin to the horse. More than a century ago Brunel recognized the incongruity of adhering to the standards of horse drawn tramways in a mechanized era but was unable to win for his ideas the support of the majority of his contemporaries. With the horse no longer the chief source of motive power on the farm, potato growers are at last free to reconsider the standards of earlier years and to discard those which are no longer applicable. Row width is certainly the most obvious and perhaps also the most profitable aspect where changes should be made.

Advantages of wide rows

Although many farmers still grow maincrop potatoes on 27 or 28 in. rows, the majority of growers in the main potato-growing areas use a width of 30 in. But in a mechanized farming system there are considerable advantages to be gained by further increasing the row width. The most important single factor which applies on all types of soils is that with increases in row width the length of row per acre decreases. An increase in row width from 30 to 36 in. will give a reduction of 1/6th (16·7 per cent) in the length of row per acre and if a machine working in the crop can move at the same forward speed and deal with the same number of rows in each pass, its rate of work will be increased by the same percentage. This is a useful improvement for any field operation, but its significance is greatest during harvesting, an operation frequently carried out under the threat of worsening weather and rapidly shortening days.

The other advantages of wide rows are usually more apparent on heavier soils. With a greater area of soil between the rows, it is not necessary to cultivate quite so deeply to make enough tilth for ridge building in the spring. This reduces the risk of incorporating pieces of raw unweathered soil, which will subsequently dry to form clods in the ridge.

Similarly, there is more room between the rows for tractor tyres to pass without consolidating the sides of the ridges. This is often seen in 28 and 30 in. rows and the pressure of the tyres frequently forms a 'hard shoulder' which, when cut by the share of the harvester, passes up the web as a series of clods

which may add considerably to the task of separation. Even if it has been possible to avoid the formation of hard shoulders, in a wet season the tyres of the tractor drawing the harvester may in narrow rows squeeze and smear the sides of the ridges; this can happen to such an extent that the soil will not break up on the harvester web and again impedes separation.

Recently emerged potatoes in 36 in. rows

Effect on yield

Although the use of wide rows may offer considerable advantages, it is essential that the effect on yield should be known if the practice is to be generally recommended.

Trials to compare yields from 30 and 36 in. rows began at Terrington E.H.F. in 1965 with the varieties Majestic and King Edward; in later years the comparison included Pentland Crown. In all cases the seed rate for each variety was the same on both row widths. The main effects on yield are shown in Table 1; the figures are averages of results over three years for Majestic and Pentland Crown and four years for King Edward.

Table 1.

	Yield in ton/acre		
	Total yield	Saleable ware	Green tubers
Majestic			
30 in. rows	19·8	13·1	2·3
36 in. rows	19·4	13·6	1·5
King Edward			
30 in. rows	18·6	11·4	1·7
36 in. rows	18·2	11·7	1·2
Pentland Crown			
30 in. rows	17·7	12·4	1·9
36 in. rows	17·7	12·8	1·6

Although the total yield from 36 in. rows was slightly lower than from 30 in. rows with two of the three varieties, in all cases the wider rows gave a small increase in the yield of saleable ware. This increase was always associated with a reduction in the amount of greening in the slightly larger ridges built on 36 in. rows. These results have been confirmed with most of the common maincrop varieties grown on a range of soil types in trials carried out by the Crop Husbandry Department of the N.A.A.S. in the Eastern Region.

Wide rows on a larger scale

Having shown that a change from 30 to 36 in. rows would not involve a loss in saleable yield but, on the contrary, a slight gain, particularly if greening is a problem, the next step was to find out the extent to which the theoretical advantages of improved workrate and reduced cloddiness could be achieved in practice. For this work large single plots of 2–3 acres were used. As far as possible the same machinery was used on both row widths and the same single-row harvester was used throughout.

The trials were carried out over a period of three years on silt loams or silty-clay loams with organic matter contents of about 2·5 per cent. Weather conditions varied considerably between the three seasons. In 1968 an excellent seedbed was prepared in a dry spring but a wet summer and autumn made harvesting extremely slow and difficult. By contrast, seedbeds were difficult to prepare in the late wet spring of 1969 on land already suffering from the effects of the excessive rainfall of the previous autumn; harvesting conditions were good but dry. In 1970 spring was again late but seedbeds were much better than in the previous year; harvesting conditions were good. Again the seed rate was the same on both row widths. The principal results from the trials are shown in Table 2.

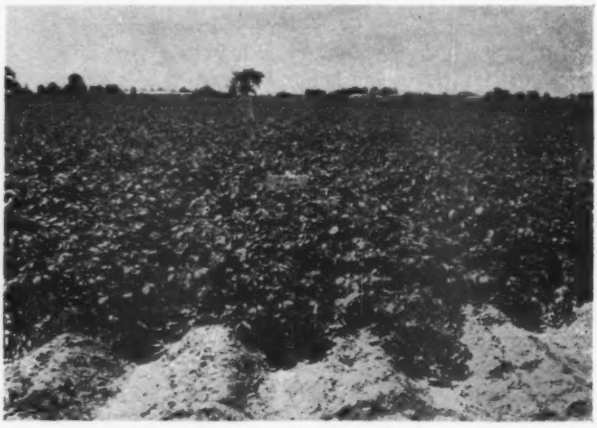
Table 2.

	Clods	Workrate	
	No. of clods over 1¼in. per ac at harvest	No. of ac harvested per 8 hr day *	% improvement in workrate over 30 in. rows
1968			
30 in. rows	9,350	1·47	—
36 in. rows	5,980	1·77	20
1969			
30 in. rows	33,600	1·57	—
36 in. rows	17,300	2·12	35
1970			
30 in. rows	13,350	2·58	—
36 in. rows	6,850	2·98	16

*includes time spent turning and other 'wasted' time including trial sampling and maintenance of machinery.

The results show that in each year there were fewer clods in the ridges on 36 in. than on 30 in. rows. The biggest difference in this respect was found after the difficult spring of 1969, when the slightly deeper inter-row working on the narrower rows brought an appreciable proportion of unweathered soil into the ridge, where it remained at harvest in the form of clods.

In 1968 and 1970 the harvester was able to travel at the same forward speed on both row widths, with the result that the workrate on 36 in. rows exceeded that on 30 in. rows by figures which were approximately the same as the theoretical one of 16·7 per cent. In 1969, however, a higher forward speed was possible on 36 in. than on 30 in. rows because of the much smaller number of clods and led to an improvement in workrate which was considerably higher than the theoretical figure. This emphasizes the point that the greatest advantage from increased row width is likely to be found on the most difficult soils.



Full crop of potatoes in 36 in. rows

Practical problems

The various investigations which have been described demonstrate clearly the benefits which would result to most growers of maincrop potatoes from adopting an increased row width. A few farmers have already made the change and rather more are trying a small acreage of 36 in. rows. Many more are interested in changing but have not been able to resolve some of the practical problems which have arisen. These problems are largely concerned with the implements and machinery to be used in the crop, for many existing machines cannot readily be adapted to work in 36 in. rows. This applies particularly to planters and two-row harvesters but there are also difficulties with such pieces of equipment as ridging bodies and haulm pulverizers.

Already machinery manufacturers have begun to respond to the increased interest in wide rows and a much greater range of equipment is now available than was the case only two years ago. As the machinery and implements used for his potato crop become due for replacement, a farmer is now able to select equipment which is more easily adaptable to use in wide rows and eventually he will be able to change to an increased row width with comparatively little additional expenditure.

Another problem with machinery concerns tractor wheel settings. For work in 36 in. rows tractor wheel centres need to be 72 in. apart compared with the 60 in. setting needed for 30 in. rows. On a farm where other row crops are grown as well as potatoes, row widths will have been chosen for them to

fit in with the existing potato row width. For instance, 20 in. rows for sugar beet are commonly used in conjunction with 30 in. rows for potatoes. If the potato row width is increased to 36 in. the row width for sugar beet must be changed either to 18 in., a retrograde step in this context, or to 24 in., which may not be suitable for multi-row harvesting systems.

A farmer who, in addition to potatoes, grows perhaps sugar beet, cauliflowers, bulbs and dwarf beans may be involved in extensive re-arrangement. In this context it should be remembered that although 36 in. rows have been used for the comparisons in the trials, a different row width between 30 and 36 in. may be more convenient in a particular set of circumstances and will enable a grower to reap at least a proportion of the advantages of 36 in. rows.

Report on Animal Health Services in Great Britain, 1969

The Report on the Animal Health Services for the year 1969 is published today. It deals with the various regulations and measures, administered through the Ministry's Veterinary Field Service, to prevent the introduction and spread of disease and for the protection of animals; the import and export of animals and animal products; and with the work of the Ministry's Veterinary Research and Investigation Services. Statistical tables provide information about outbreaks of disease, stock slaughtered and compensation paid.

Copies of the Report can be obtained from H.M. Stationery Office, price 17s. 0d. (by post 17s. 10d.).

43. East Sussex

J. A. Wyatt

'And along the sky, the line of the Downs
So noble and so bare'

Hilaire Belloc

FROM much of the county of East Sussex the chalk hills of the South Downs dominate the southern skyline standing as they do from Beachy Head to Ditchling Beacon and stretching out beyond the border with West Sussex. Below the steep escarpment of their northern face the Weald Clay valley runs in a belt three to five miles wide from the western boundary of the county to the sea at Pevensey Bay. Northwards from the Weald Clay the land rises gradually to the domed ridge of the High Weald to fall again more steeply to the borders with Kent and Surrey.

The High Weald

The High Weald occupies the largest part of the county. The very variable soils of the Ashdown and Tunbridge Wells Sands and the Wadhurst Clay are generally of low inherent fertility and are often poorly drained. The steep valleys which cut into the southern slope deter the ploughman and the numerous patches of woodland add to his difficulties. This was the heart of Sylva Anderida of Roman times and in spite of the clearance of so much of the woodland, allegedly for the furnaces of the great medieval Wealden Iron Industry, East Sussex is still the most heavily wooded of all English counties. In such country, grass is King. Dairy farming is the most common use to which this grass is put and milk is indeed the major agricultural product of the county. The ability of dairy cows to respond to intensification, and the proximity of the markets of the South-East, has inevitably led to the displacement of the red of the native Sussex by the black and white of the Friesian. Efficient grassland management has been greatly encouraged by the Sussex Grassland Group Association which originated in this area. Towards the east, near the Romney Marsh, Sussex cattle still hold their own on some of the farms and on the coastal marshes there are large numbers of Kent or Romney Marsh sheep. Even here, however, the numbers of sheep are steadily falling. A few farms winter ewes indoors but the traditional practice of heavily stocking pastures in summer combined with minimum cost in winter is generally maintained. It is a system which has outlasted most of the more sophisticated arable systems elsewhere, and it still has its place here.

Fruit and hops

Along the Kent border much of the better land where water and air drainage allow is planted with apples. Many of these orchards have been planted recently and, under good management, are producing fruit of high quality. Strawberry growing is a comparatively new development in this area. Oast houses, with their conical roofs and white cowls, are seen here too, and hops are an important crop on many farms. Mechanical picking has ended the picturesque 'cockney' invasion each September for the hop harvest, and large modern barns housing the hop picking machines replace the long rows of hoppers huts.

Co-operation

Towards the south and east of the High Weald mass, the slopes are more gentle and the country more open. This land, together with the alluvial flats along the river valleys, is more suitable for other husbandry, including cereals. A number of very successful co-operative grain storage syndicates have been set up here.

The Weald Clay Valley

The Weald Clay is deficient in both lime and potash, and drainage is often difficult. The sandstone ridge, which is so prominent a feature on the northern side of the Wealden system, is hardly apparent here. The plough, however, reveals the difference between the Weald Clay and the narrow bands of Lower Greensand, Gault Clay and Upper Greensand. The proportion of arable land in this valley is quite high but dairying and other livestock enterprises are important on most farms. In places on the sandstones and on valley gravels around Ringmer, Barcombe and Lewes, potatoes and some vegetables are grown. North of this area, reaching up into the High Weald around Newick and Chailey, there is an old established soft fruit area of smallholdings famous for their gooseberries. The gooseberry variety Leveller originated here.

The South Downs

The South Downs, which extend south from their escarpment seven miles or so to the chalk cliffs on the coast, form the true arable area of the county. Cereals, especially barley, predominate but the area in wheat has tended to increase over recent years. Few break crops other than leys are grown but continuous cropping with cereals for more than five years is uncommon. The leys on the steep sides of the valleys are often utilized by single suckling beef herds of various cross-breeds run with a Hereford or Sussex bull.

Sheep have almost disappeared from these hills. John Ellman developed the South Down breed of sheep in the centre of this area, but it is hard to find them here now. There is one pure bred flock at Ringmer, only a few miles from the original farm at which they were bred.

Poultry

East Sussex was the home of the Light Sussex hen, and the county led in the development of the broiler industry. Besides the large-scale broiler and

egg producing enterprises scattered about the county, many smaller units are producing brown eggs for sale at the farm gate to local residents and to the weekend motorists on their way to the South Coast.

Town and country

Contact between town and country in a county so situated between London and the South Coast is steadily reducing the differences between their respective inhabitants. Nevertheless, the casual visitor is still largely ignorant of farming ways and is often quite rightly the object of suspicion to the farmer. But in this county there is a rapidly growing awareness and eagerness to find out how adjustments may be made to meet the needs of the visitor, if possible to the advantage of the farmer.

* * *

Ministry Publications

Since the list published in the January 1971 issue of *Agriculture* (p. 42) the following publications have been issued.

MAJOR PUBLICATIONS

OUT OF SERIES

Manual of Nutrition (Revised) 9*s.* 6*d.* (by post 10*s.* 2*d.*)
(SBN 11 240965 2)

FREE ISSUES

ADVISORY LEAFLETS

No. 118. Dairy Goat-keeping (Revised).
No. 215. Gooseberries (Revised).
No. 259. Leopard Moth (Revised).

SHORT TERM LEAFLETS

No. 69. Weed Control in Nursery Stock Production (Revised).
No. 113. Migratory Root Eelworms (New).

UNNUMBERED LEAFLET

Code of Practice for Fumigation of Commodities in Craft with Methyl Bromide—April 1970 (New).

GETTING DOWN TO DRAINAGE

No. 4. Arranging your Drainage Contract (New).
No. 6. Drainage Operations (New).
No. 7. Drainage Maintenance (New).
No. 10. Subsoiling (New).

Priced publications are obtainable from Government Bookshops (addresses on p. 94) or through any bookseller. Single copies of the free items are obtainable from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

A 300-Cow Dairy Unit at Goodwood

A. V. M. Gossage, *Senior Assistant Land Commissioner, Guildford*

BEST known for its beautiful racecourse and former motor racing track, the Goodwood Estate lies on the wooded slopes of the Sussex Downs within sight of the spire of Chichester Cathedral. Included within the estate is the Mortar Mill Farm.

In 1965 the Company's Directors, who include the Duke of Richmond and Gordon and his son, the Earl of March, decided to increase the dairy herd on the farm from 110 (milked through an abreast parlour) to a modern 300-cow unit with followers. This was done at the expense of the beef herd and sheep flock because the existing dairy cow performance was at a high level, milk sales per cow being over 1,000 gallons.

The soil is generally a free-draining loam over gravel, which quickly dries out after heavy rain. The site for the new buildings was chosen so that the cows would have access to surrounding grazing land in the summer.

The building

The framed building erected has four spans of 50, 60, 75 and 50 ft respectively and a length of 105 ft. Cows are bedded in six separate yards, each containing fifty cows. Yards 1 and 2 have separate mangers with a central drive through, while the paired yards 3 and 4 and 5 and 6 have central mangers 4 ft wide. The manger length per cow is 2 ft. Each cow has an average 50 sq. ft of strawed bedded area and 20 sq. ft for loafing and feeding. The bedded areas are 24 ft wide and the feeding areas 10 ft.

Water troughs are set back on the bedded areas to allow a clean sweep for slurry and the troughs are screened off at rear and sides to ensure that the cows drink while standing on the concrete feeding area. There is a 6 in. square curb between the bedded and loafing areas to retain straw while excluding slurry.

The external cladding to the 8 ft high concrete walls consists of $\frac{7}{8}$ in. $\times$ 4 in. sawn preserved timber space boarding with 1 in. gaps, from eaves height to an average of 4 ft 6 in. below the eaves. The covered yards have continuous open ridge ventilation.

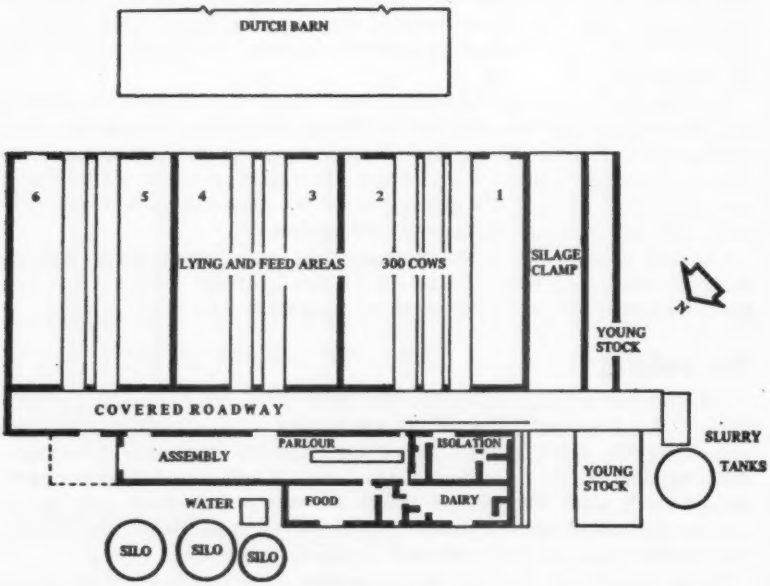
Feeding

At the initial strawing of the bedded areas two bales are placed tightly along, and adjacent to, the feeding area to assist cows in stepping down;

the remainder of the bedded areas are thickly strawed, using approximately 120 bales per area. About one ton of straw per cow is used each winter. There is a Dutch Barn measuring 150 × 60 × 18 ft close to the yards which holds 35–40,000 straw bales.

For feeding, the two mangers serving yards 3 and 4 and 5 and 6 are fed by automatic chain and flight conveyors from two silage towers each with a capacity of about 220 tons of dry matter. The conveyors are also used for feeding crushed barley from another tower silo holding 300–330 tons.

The lower yielding cows in yards 1 and 2 are fed from the nearby 500–ton bunker silo from which the silage is removed by foreloader and placed in the mangers. In the food room a bulk hopper of ten tons capacity supplies the parlour dispensers with dairy cubes along a chain and flight conveyor. Cows are yarded according to yield and are drawn from two adjacent yards at a time; the collecting yard allows 15 sq. ft per cow and is an integral part of the parlour.



Plan of dairy unit

Herringbone parlour

The herringbone parlour is a 12/24 with gridded channels along each standing and having a ducted ventilation system allowing warm and cool air to be blown into the pit. After passing through the parlour, the cows return to the same yards, or can be drafted into the crush race or the isolation compound.

The concrete loafing and feeding areas are sloped towards the covered way. They are cleaned twice a day, using a tractor and rear mounted scraper,

the slurry being scraped into the covered way and then down to the loading ramp and slurry tanks. The more solid material is pushed over the ramp into a muck trailer and taken to heaps, usually every day.

Storage tanks

The two storage tanks are a reinforced concrete structure, 24 ft long, 12 ft wide and 10 ft deep with a capacity of 16,000 gallons, and a circular above-ground silo 26 ft in diameter by 11 ft 6 in. high, capacity 36,000 gallons. The concrete tank is emptied every ten days during winter into a 700 gallon vacuum tanker. The above ground silo is a reserve store for spring and early summer use.

There are four water hydrants in the covered roadway and a pressure hose washes down the collecting yard, parlour and roadway to a number of catchpits; the washings, along with those from the parlour and dairy, run underground through a settling tank to a disused gravel pit. Scraping the yards takes about one hour a day and emptying the slurry tank about eight hours every ten days.

Costs

The gross cost of the whole scheme, inclusive of buildings, tower silos and fixed plant and machinery, amounted to £67,176, or £224 per cow; the net cost after grant amounted to £43,869, £146 per cow.

The unit came into operation in December 1966 and results achieved so far show that the gallonage of milk sold per cow is now higher than it was before the dairy herd was expanded.

New President of Royal Agricultural Society of England

H.R.H. The Duchess of Gloucester has honoured the Royal Agricultural Society of England by accepting the office of President for the year 1971. Her Royal Highness, who is no stranger to the Society, has shown a keen interest in its affairs for a great number of years, and has paid many visits to the Royal Show, the last being in 1970. She is the seventeenth member of the Royal Family to hold this office. The Duke of Gloucester was elected President in 1930, and became a Trustee in 1935. Her Royal Highness succeeds The Lord Rank, LL.D., who has been elected a Vice-President.

Sir Peter Greenwell, Bt., B.A., T.D., of Butley Abbey Farm, Woodbridge, Suffolk, has been elected Deputy President. Sir Peter, who was educated atWinchester, and Trinity College Cambridge, is a former Justice of the Peace, and High Sheriff of Suffolk, and has been a member of the Council of the Society since 1949 and a Trustee since 1966.

Mr. Frank Sykes, C.V.O., D.L., of Stockton, Warminster, Wiltshire, has also been elected a Vice-President of the Society. Mr. Sykes was first elected to the Council in 1958, and is well-known as the Steward of the Royal Show's International Pavilion.

in brief

- **What goes in at the mouth**
- **Carrots and the consumer**
- **Botany, a retarded science**

What goes in at the mouth

SOME interesting facts and figures have been brought together in a leaflet issued by C.A.F.M.N.A. (The Compound Animal Feeding Stuffs Manufacturers National Association). They highlight on the one hand the massive organization and economic prominence of the feedingstuffs industry, and on the other the livestock farmers' expenditure on the skilfully formulated products which flow from mill to farm throughout Britain. Of the 800–900 compound mills in operation, more than 100, which include the largest producing several thousand tons a week, are centred on the deep water ports of Bristol, Hull, Liverpool, London, Glasgow and Belfast. The rest are scattered between the smaller ports and agricultural areas inland. Whereas ten years ago the proportional output of the total production of compounds, balancers and concentrates in Britain was 71 per cent at the deep water ports and 29 per cent elsewhere, today the corresponding figures are 56 and 44 per cent respectively.

Percentage feed allocations for Britain in 1969 between various classes of stock are shown as being for cattle and calves 39·1, pigs 20·5, poultry 37·9 and others (including sheep and lambs) 2·5—all, with the exception of that for poultry, being slightly up on 1968. In the first six months of 1970 the output of the three classes of feeds was 1·4 per cent above the 1969 level. The year's feed bill to farmers can be put at some £524 million—29·6 per cent of all farm outgoings, of which compounds etc. account for some £390 million, almost, says C.A.F.M.N.A., as much as the expenditure on machinery and fertilizers.

Of the total raw materials for compounds used by the feedingstuffs industry, about 40 per cent comes from home farms in the form of cereals, beet pulp, beans, dried grass, etc.; and home industries supply some 21 per cent in milling by-products meals, etc. In 1969/70 more than 4 million tons of raw material, valued at over £80 million, was home grown. This is around 40 per cent of all raw materials used, notwithstanding an almost unchanged barley crop, a smaller wheat crop and a bigger off-take from flour milling. At about 5½ million tons, the level of imported feedingstuffs (in the main, crops like maize and sorghums and processed material such as oil cakes and meals) has fluctuated little in recent years and still is below what it was before the war. The cost in 1967/68 was £155 million, which rose to £164 million in 1968/69, and is estimated to be about £180 million for 1969/70.

Carrots and the consumer

Rather like potatoes, carrots have not enjoyed a high social status, notwithstanding the nutritional value of carotene as a source of vitamin A and the boost they received during the last war as an aid to vision in the blackout! Now, however, they are steadily rising in consumer estimation, particularly as a processed product. This is mainly in canned form, which provides a tender and attractive vegetable ready for serving within a matter of a few minutes. Whole, diced or sliced, their

appeal to the housewife is increasing; in a dehydrated form they add to the nourishment of soups, and their inclusion in baby foods is a daily health promotion in the junior section of society.

Over the last two or three years the total carrot acreage in this country has shown a marked expansion—to around 40,000 tons last year—but only about one-quarter of this production goes for processing. An awakened consumer interest and the fact that on suitable soils carrots can be injected into the rotation as a useful cereal break crop, suggests a promising future where contracts with the processors can be made. Carrots also have the advantage of being a poor land crop but ideal for the light sandy and peat soils where root growth is unimpeded. It follows from the specialist demand of processors that it is carrots of good quality and of the right size which will fetch the top prices, particularly as new growers accumulate experience in fulfilling the processors' needs and time the lifting of their crops to coincide with those needs.

Concurrently, 'finger' carrots (e.g., Amsterdam Forcing) are making their own increasing appeal and a much higher market price over the pedestrian Chanteney type. Well graded and pre-packed, they have an eye-appeal which does not go unheeded by the questing housewife. They fail only insofar as the supply of the home-grown product does not measure up to demand, and for the first six or seven months of the year recourse has to be made to imported produce. The limiting factor at that time of the year as far as we are concerned is largely one of climate. Warmer conditions are needed, and it is with this in mind that the N.A.A.S. is probing the possibilities of more benign areas in west Cornwall and the Isles of Scilly; and at the Arthur Rickwood E. H. F., in Cambridgeshire, techniques of storage are being examined with a view to extending the home-grown carrots season through to March, and cultural improvements are being sought to get an earlier harvest.

Botany, a retarded science

Where does botany stand in the scientific hierarchy today? It was to this question that Professor D. H. Jennings, of Liverpool University, addressed himself in his inaugural lecture last October. The great edifice of modern scientific development has grown progressively over several centuries, but in the opinion of Professor Jennings botany has had too slow a growth rate compared with that of other sciences. Until the 1930s the emphasis in botany was on purely observational work rather than quantification, with but the solitary research worker and the use of simple apparatus; and by the same token progress towards a physiochemical interpretation of plant functioning was retarded. Grounded by this tradition and a lack of appropriate techniques, botany has tended to remain a 'little science'.

'A major, if not the major, aim of botany,' said Professor Jennings, 'is to understand how a plant reacts to its environment, whether it be the amount of light it receives, the soil in which it grows, or indeed the competitive pressures from other plants. What we want to know is why certain plants are where they are in the natural environment or will grow where they are planted.' He urged the need for artificial enviroment facilities to allow research in plant growth to the full; and, not withstanding that the capital investment and tooling up with essential sophisticated equipment would be costly, for a new and enlightened attitude towards this age-old science if it is to make its full contribution to modern scientific inquiry and the pool of scientific expertise.

Prof. Jennings's lecture under the title of *Little Botany, Big Botany* has just been made available in book form, price 7*s.* 6*d.* from Liverpool University.

AGRIC.

Grassland Improvement. DR. A. T. SEMPLE. Leonard Hill Books, 1970. £7·50.

The stated objective of the book is to show how present grasslands can be made to produce livestock and livestock products with maximum efficiency and to show how areas at present unproductive can be converted into productive grazing lands. It is mentioned that a great deal more emphasis is placed on the problems of improving tropical pastures than on those of temperate zones. This emphasis is timely and commendable and Dr. Semple's extensive experience of grassland in temperate and tropical countries, and in humid and arid areas, fits him for his declared task.

The opening chapters deal with a history of grassland and the geographical distribution of types of grassland in relation to climate. Nutritional quality, establishment, fertilizing, weed control, management and conservation are discussed in the succeeding chapters. The book closes with some national case-histories of grassland improvement and a plea for more research. The illustrations are marred by their variable quality and, in many, their lack of content.

Although there is an immense amount of information contained in the book it is not as readable as the author's earlier work *Improving The World's Grasslands* and more of the author's personal opinions in place of the numerous extracts would have been welcomed. It is unfortunate that many references are pre-1960; research carried out during the last decade, notably in tropical Australia and Africa, merits more attention than has been given. Similarly, more emphasis could have been given to recent findings on nutritive quality, the role of legumes and nitrogen fertilization.

One is left with the impression, *vide* the plates of large equipment, that grassland improvement requires costly and sophisticated mechanical equipment. While this may be necessary, there is still much that can be done simply by hand labour in the small-scale farming areas where cash is desperately short. Little progress will be made in such areas until the technician can adjust his thinking to the scale of the peasant farmer. In the reviewer's experience a great deal of well-intentioned technical assistance has foundered, and some has been positively dangerous, because this point has not been recognized.

As a manual on how to improve grassland the book is not entirely successful. However, an all-embracing work of this sort is enormously difficult to write and the text reflects this difficulty. It does demonstrate the diversity of grassland environments and problems. Despite its deficiencies there is much of interest and the bibliography is excellent. It is a volume which deserves a place in libraries at research institutes and universities and should be read by everyone with an interest in grassland improvement and ruminant production in developing countries.

J.M.

Health and Disease in Farm Animals. W. H. PARKER. Pergamon Press Ltd., 1970. Hard cover £2, flexi-cover £1·50.

For long the author has been interested in agricultural education as a lecturer in veterinary science for the National Diploma in Agriculture and he has produced this authoritative book on the subjects of animal health and disease. He has also given readers the benefit of his vast experience in the Ministry's Veterinary Investigation Service which has such glorious opportunities to get the 'feel' of veterinary practice in this country. He has not catalogued a list of ailments with symptoms, course and treatment, but has aimed to promote health of livestock by describing good husbandry and farm preventive medicine in a logical and refreshing way. I think readers will agree he has successfully done his part.

About one quarter of the text is spent on a description of the structure and function of the various systems of the animal body such as those of digestion, respiration and reproduction. The remainder of the book deals with the principles of disease, its statutory control, housing, health and more specifically, with measures to prevent and control the common ailments of British farm stock with the exception of those of poultry. There are, for example, very valuable chapters on the needs of the newborn, mastitis, metabolic and parasitic diseases. Layout, printing and index are good.

In the short term not many points which the author makes are likely to be outdated,

but this first edition will, no doubt, prove popular and warrant further editions and the opportunity to revise and renew a volume which is likely to become a necessity for the bookshelf of all agricultural students taking courses in veterinary hygiene or science and stockmanship.

It is good value in its modern flexi-cover form, but a coloured background for the cover would improve its presentation.

J.W.R.P.

Farming Systems of the World. A. N. DUCKHAM and G. B. MASEFIELD. Chatto and Winders Ltd., 1970. £6.

The work makes an original contribution to the study of comparative temperate and tropical agriculture. Although the book will be valued by field agriculturists, research workers, students and agricultural administrators, it will also interest economists, geographers and ecologists, and those concerned with agriculture in the European Community will find the chapters on France and the Netherlands interesting.

Within the compass of a single book and with the breadth of detail and practical knowledge which the authors bring to their subject, it would not be possible to cover comprehensively all aspects of world farming. Wisely, therefore, within the various farming systems of the world the authors have been selective in their examples and comparisons. Even so, the studies range far and wide and include France, the Netherlands, Sweden, Egypt, Israel, Canada, the U.S.A., several Central and South American states, East and West Africa, the Indian Sub-continent, Japan, Malaysia, Australia and New Zealand.

The first Part of the book analyses, with the aid of agricultural, economic, social and ecological data, the types of the farming systems and what determines their location. This Part ends with a short chapter, which could with advantage have been longer, giving a synthesis and comparative analysis of the farming systems.

The second Part describes these farming systems in the above-mentioned countries in relation to the analysis made in the first Part with special reference to climate, soils, vegetation, socio-economic factors, etc.

The final Part includes an examination of the trends in temperate and tropical agriculture and touches on the related problems of water conservation and pollution. The relationship between food production and world population trends is considered but no attempt is made to pontificate on the demand/supply position: rather, the authors hope that their mathematical models for the pattern of farming systems in the advanced temperate areas will be of use in devising, when more data is available, similar models for the developing countries. Thus, with more comprehensive analysis of food and farming problems than is available today, the alternative solutions in this *field* can be more appropriately evaluated for the benefit of mankind.

The book is amply supplied with maps, photographs, diagrams, metric conversion tables, source references and a combined glossary and index.

G.W.F.

books received

Agriculture in Uganda. Second Edition. Edited by J. D. Jameson. Published for the Uganda Government Ministry of Agriculture and Forestry by Oxford University Press. 1970. £5.

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The Economics of Potato Storage. Sutton Bridge Experimental Station Report No. 5. Copies available free of charge from Publicity Department, Potato Marketing Board, 50 Hans Crescent, London, S.W.1. 1970.

AGRICULTURAL CHEMICALS

APPROVAL SCHEME

The booklet 'Approved Products for Farmers and Growers, 1971' will be available this month.

Farmers and growers will be able to obtain copies, free of charge, from the Ministry Divisional Office appropriate to their area.

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